

What is claimed:

1. A method for providing a multicast of a packet, which is included in a transport stream, in a digital network, the method comprising:
 - receiving at an input port the transport stream having a plurality of packets included therein;
 - determining whether a given packet of the plurality of packets is a multicast packet or a unicast packet, wherein a multicast packet is designated for transmission from a plurality of modulators and a unicast packet is designated for transmission from only one modulator of the plurality of modulators;
 - transmitting and modulating the given packet from more than one modulator of the plurality of modulators when the given packet is a multicast packet; and
 - transmitting and modulating the given packet from only one modulator of the plurality of modulators when the given packet is a unicast packet.
2. The method of claim 1, wherein the determining step further includes the steps of:
 - identifying packets of the plurality of packets that are to be transmitted from at least one modulator; and
 - associating a modulator identifier with each identified packet, wherein the modulator identifier identifies each modulator from which the packet is to be transmitted.
3. The method of claim 2, further including the steps of:
 - processing the given packet for transmission from at least one multimodulator;
 - copying the given packet when the given packet is a multicast packet; and
 - providing each modulator identified by the modulator identifier with a copy of the given packet, wherein each copy has a common output PID value associated therewith.
4. The method of claim 3, wherein the step of processing includes encrypting the given packet.
5. The method of claim 3, further including the step of:
 - storing in a buffer of a plurality of buffers each identified packet having a modulator identifier associated therewith.
6. The method of claim 5, wherein a first buffer of the plurality of the buffers is a multicast buffer for storing multicast packets, and wherein a second buffer of the plurality of the buffers is a unicast buffer for storing unicast packets.

- 1 7. The method of claim 5, further including the steps of:
2 receiving a message indicating that a particular modulator of the plurality of modulators is
3 ready to receive a packet for transmission therefrom; and
4 sending the given packet from a given buffer of the plurality of buffers to the particular
5 modulator, wherein the modulator identifier associated with the given packet
6 identifies the particular modulator.
- 1 8. The method of claim 5, wherein the plurality of buffers include a plurality of unicast buffers,
2 each unicast buffer is associated with a given modulator of the plurality of modulators and is adapted
3 to store unicast packets that are for transmission from the given modulator associated with the unicast
4 buffer, and the plurality of buffers includes a multicast buffer for storing multicast packets therein.
- 1 9. The method of claim 8, prior to the step of sending, further including the step of:
2 determining whether to check the unicast buffer associated with the particular modulator for a
3 unicast packet for transmission from the particular modulator or to check the
4 multicast buffer for a multicast packet;
5 responsive to determining to check the associated unicast buffer, retrieving from the
6 associated unicast buffer the given packet when there is a unicast packet stored
7 therein; and
8 responsive to determining to check the multicast buffer, determining whether a packet stored
9 in the multicast buffer is for transmission from the particular modulator and retrieving
10 the given packet from the multicast buffer when the given packet is determined to be
11 for transmission from the particular port.
- 1 10. The method of claim 9, prior to the step of sending, further including the step of:
2 associating a count register of a plurality of count registers with each modulator of the
3 plurality of modulators;
4 incrementing the count register associated with the particular modulator indicated by the
5 message; and
6 when a packet is retrieved, decrementing each count register associated with a modulator
7 identified by the modulator identifier associated with the retrieved given packet.
- 1 11. The method of claim 10, wherein each unicast buffer is a first-in-first-out buffer, and when
2 the given packet is retrieved from the given unicast buffer the given packet is the current first-in
3 packet, and wherein when the given packet is retrieved from the multicast buffer the given packet is
4 determined at least in part by the current status of the plurality of count registers and at least in part by
5 the modulator identifier associated with the given packet.

- 1 12. The method of claim 9, wherein the determination for checking the multicast buffer or the
2 associated unicast buffer is based at least in part on the current status of the multicast buffer and the
3 associated unicast buffer.
- 1 13. The method of claim 9, wherein the determination for checking the multicast buffer or the
2 associated unicast buffer is based at least in part on prior determinations.
- 1 14. The method of claim 1, wherein at least one modulator of the plurality of modulators is a
2 radio frequency modulator.
- 1 15. The method of claim 14, wherein the radio frequency modulator is a quadrature amplitude
2 modulation modulator.
- 1 16. The method of claim 1, wherein the packets of the transport stream include packets
2 conforming to MPEG protocols, and the given packet has a first PID when it is received and a second
3 PID when it is transmitted, wherein the second PID is different from the first PID.
- 1 17. The method of claim 1, further including the steps of:
receiving a second transport stream at a second input port, the second transport stream
including a plurality of packets;
extracting from the first and second transport streams each packet that is to be transmitted
from at least one modulator of the plurality of modulators; and
sorting extracted packets into a plurality of groups, the plurality of groups including a
multicast group that includes multicast packets from the first and second transport
streams and at least one unicast group that includes unicast packets from the first and
second transport streams.
- 1 18. The method of claim 17, further including the step of:
2 associating a modulator identifier with each packet of the multicast group, wherein the
3 modulator identifier identifies each modulator of the plurality of modulators from
4 which the associated packet is transmitted.
- 1 19. The method of claim 17, wherein the at least one unicast group is a plurality of unicast
2 groups, each unicast group is associated with a given modulator of the plurality of modulators, and
3 further including the step of:
4 associating a modulator identifier with each packet of each unicast group, wherein the
5 modulator identifier identifies the given modulator of the plurality of modulators
6 from which the associated packet is transmitted.
- 1 20. The method of claim 19, wherein the first and second transport streams include packets that
2 conform to MPEG protocols.

1 21. The method of claim 20, wherein at least one packet of the first transport stream has a first
2 PID value associated therewith and at least one packet of the second transport stream has a second
3 PID value associated therewith, and wherein the first PID value and the second PID value are the
4 same value.

1 22. The method of claim 19, wherein when a packet conforming to MPEG protocols is received
2 the packet has a first PID value associated therewith, and the packet has a second PID value
3 associated therewith when the packet is transmitted and when the packet is a multicast packet.

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- 1 23. An apparatus in a digital network that receives a transport stream and transmits a plurality of
2 transport streams, the apparatus comprising:
3 an input port adapted to receive the transport stream having a plurality of packets included
4 therein;
5 a processor in communication with the input port, the processor adapted to determine which
6 packets of the transport stream are multicast and unicast packets, wherein a multicast
7 packet is a packet that is transmitted from a plurality of modulators, and a unicast
8 packet is transmitted from only one modulator; and
9 a plurality of modulators in communication with the processor, each modulator adapted to
10 modulate and transmit packets therefrom.
- 1 24. The apparatus of claim 23, wherein the processor is further adapted to associate a modulator
2 identifier with each multicast packet and each unicast packet, wherein the modulator identifier
3 identifies each modulator from which the multicast packet is to be transmitted.
- 4 25. The apparatus of claim 24, wherein the processor is further adapted to process for
5 transmission from at least one multimodulator multicast and unicast packets, copy a given multicast
6 packet, and provide each modulator identified by the modulator identifier with a copy of the given
7 multicast packet, wherein each copy has a common output PID value associated therewith.
- 8 26. The apparatus of claim 25, wherein the processor processes a particular packet for
9 transmission by encrypting the particular packet.
- 1 27. The apparatus of claim 25, further including:
2 a plurality of buffers in communication with the processor and the plurality of modulators,
3 each buffer adapted to store a plurality of received packets therein.
- 4 28. The apparatus of claim 27, wherein a first buffer of the plurality of the buffers is a multicast
5 buffer for storing multicast packets, and wherein a second buffer of the plurality of the buffers is a
6 unicast buffer for storing unicast packets.
- 7 29. The apparatus of claim 27, wherein the processor receives a message indicating that a
8 particular modulator of the plurality of modulators is ready to receive a packet for transmission
9 therefrom, and responsive thereto, the processor sends a given packet from a given buffer of the
10 plurality of buffers to the particular modulator, wherein the modulator identifier associated with the
given packet identifies the particular modulator.

1 30. The apparatus of claim 27, wherein the plurality of buffers include a plurality of unicast
2 buffers, each unicast buffer is associated with a given modulator of the plurality of modulators and is
3 adapted to store unicast packets that are for transmission from the given modulator associated with the
4 unicast buffer, and the plurality of buffers includes a multicast buffer for storing multicast packets
5 therein.

1 31. The apparatus of claim 30, wherein in response to the message received from the particular
2 modulator the processor determines whether to retrieve a unicast packet from the unicast buffer
3 associated with the particular modulator or to retrieve a multicast packet from the multicast buffer.

1 32. The apparatus of claim 31, wherein the processor is further adapted to keep count of packet
2 requests from each modulator, and the processor decreases the packet request count for the particular
3 modulator when a packet is sent to the particular modulator.

1 33. The apparatus of claim 32, wherein each unicast buffer is a first-in-first-out buffer, and when
2 a given packet is retrieved from the unicast buffer associated with the particular modulator the given
3 packet is the current first-in packet, and wherein when a given packet is retrieved from the multicast
4 buffer the given packet is determined at least in part by the current status of the plurality of count
5 registers and at least in part by the modulator identifier associated with the given packet.

1 34. The apparatus of claim 31, wherein the determination for checking the multicast buffer or the
2 associated unicast buffer is based at least in part on the current status of the multicast buffer and the
3 associated unicast buffer.

1 35. The apparatus of claim 31, wherein the determination for checking the multicast buffer or the
2 associated unicast buffer is based at least in part on prior determinations.

1 36. The apparatus of claim 23, wherein at least one modulator of the plurality of modulators is a
2 radio frequency modulator.

1 37. The apparatus of claim 36, wherein the radio frequency modulator is a quadrature amplitude
2 modulation modulator.

1 38. The apparatus of claim 23, wherein the packets of the transport stream include packets
2 conforming to MPEG protocols, and the given packet has a first PID when it is received and a second
3 PID when it is transmitted, wherein the second PID is different from the first PID.

1 39. The apparatus of claim 23, further including:
2 a second input port in communication with the processor and the plurality of modulators, the
3 second input port adapted to receive a second transport stream at a second input port,
4 the second transport stream including a plurality of packets; and
5 wherein the processor is further adapted to extract from the first and second transport streams
6 each packet that is to be transmitted from at least one modulator of the plurality of
7 modulators, and the processor is adapted to sort the extracted packets into a plurality of
8 groups, the plurality of groups including a multicast group that includes multicast packets
9 from the first and second transport streams and at least one unicast group that includes unicast
10 packets from the first and second transport streams.

1 40. The apparatus of claim 39, wherein the process is further adapted to associate a modulator
2 identifier with each packet of the multicast group, wherein the modulator identifier identifies each
3 modulator of the plurality of modulators from which the associated packet is transmitted.

1 41. The apparatus of claim 39, wherein the at least one unicast group is a plurality of unicast
2 groups, each unicast group is associated with a given modulator of the plurality of modulators, and the
3 processor is further adapted to associate a modulator identifier with each packet of each unicast group,
4 wherein the modulator identifier identifies the given modulator of the plurality of modulators from
5 which the associated packet is transmitted.

1 42. The apparatus of claim 41, wherein the first and second transport streams include packets that
2 conform to MPEG protocols.

1 43. The apparatus of claim 42, wherein at least one packet of the first transport stream has a first
2 PID value associated therewith and at least one packet of the second transport stream has a second
3 PID value associated therewith, and wherein the first PID value and the second PID value are the
4 same value.

1 44. The apparatus of claim 41, wherein when a packet conforming to MPEG protocols is received
2 the packet has a first PID value associated therewith, and the packet has a second PID value
3 associated therewith when the packet is transmitted and when the packet is a multicast packet.

1 45. An apparatus in a digital network that receives a transport stream and transmits a plurality of
2 transport streams, the apparatus comprising:

3 an input port adapted to receive the transport stream having a plurality of PID streams included
4 therein;

5 a plurality of modulators in communication with the input port, wherein at least one
6 modulator of the plurality of modulators is adapted to modulate and transmit a subset
7 of the plurality of PID streams therefrom.

1 46. The apparatus of claim 45, wherein the plurality of modulators includes a first modulator and
2 a second modulator, the first modulator transmitting a first plurality of the plurality of PID streams
3 therefrom, the second modulator transmitting a second plurality of the plurality of PID streams
4 therefrom, and the first plurality of PID streams is different than the second plurality of PID streams.

1 47. The apparatus of claim 46, wherein the first plurality of PID streams includes a given PID
2 stream and the second plurality of PID streams includes the given PID stream.

3 48. The apparatus of claim 47, wherein the given PID stream of the first plurality of PID streams
4 includes a first plurality of packets, the given PID stream of the second plurality of PID streams
5 includes a second plurality of packets, and the first and second plurality of PID streams are the same.

6 49. The apparatus of claim 48, wherein the plurality of packets of the given PID stream have a
7 common PID value and the plurality of packets had a different common PID value when received in
8 the input port.

9 50. The apparatus of claim 45, wherein the received transport stream includes a given PID stream
10 that consists of a plurality of packets having a first common PID value associated therewith, the
1 plurality of packets have a second common PID value associated therewith when they are modulated
2 and transmitted from at least one modulator of the plurality of the modulators.

3 51. The apparatus of claim 45, wherein the plurality of PID streams received in the input port
4 includes a first given PID stream having a plurality of packets with a first common PID value
5 associated therewith; and further including:

6 a second input port adapted to receive a second transport stream having a second plurality of
7 PID streams included therein, the second plurality of received PID streams includes a
8 second given PID stream having a plurality of packets with a second common PID
9 value associated therewith; and

10 wherein at least one modulator of the plurality of modulators modulates and transmits
therefrom the plurality of packets of the first given PID stream and the plurality of
packets of the second given PID stream.

- 1 52. The apparatus of claim 51, wherein the plurality of packets of the second given PID stream
2 have a third common PID values associated therewith when the plurality of packets are transmitted,
3 and second and third common PID values are different.
- 1 53. The apparatus of claim 52, wherein the at least one modulator is a plurality of modulators.
- 1 54. The apparatus of claim 52, wherein the at least one modulator is a radio frequency modulator.
- 1 55. The apparatus of claim 54, wherein the at least one modulator is a quadrature amplitude
2 modulation modulator.